Develop Business Model for Implementation and Operation of a Statewide GNSS RTN System

by

Ahmed Al-Kaisy, PhD, PE
Professor & Program Manager – Safety and Operations
Western Transportation Institute
Montana State University
Bozeman, MT 59717-4250

A proposal prepared for the

Montana Department of Transportation
2701 Prospect Avenue
P.O. Box 201001
Helena, MT 59620-1001

August 2020

TABLE OF CONTENTS

List of Tables ii
Problem Statement 1
Background Summary 2
Benefits and Business Case 3
Objectives 4
Research Plan 5
1.0 Project Management 5
2.0 Literature Review 5
3.0 State-of-the-Practice Assessment 6
4.0 Characterize Montana GNSS-RTN Existing Infrastructure 7
5.0 Catalog and Select Viable Business Models for Statewide GNSS-RTN 7
6.0 Business Model Evaluation for Future Montana GNSS alternative Systems 7
7.0 Performance Measures Report 7
8.0 Final Report 7
9.0 Implementation Report 8
MDT Involvement 9
Products 10
Implementation 11
Schedule 12
Budget 13
MDT Budget 14
Staffing 16
Facilities 17
References 18

LIST OF TABLES

Table 1: Project Schedule 12
Table 2: Summary of Cost by Budget Category 13
Table 3: Summary of Cost by Budget Category – MDT Project Budget 14
Table 4: Cost by Task 14
Table 5: Expenditures by State Fiscal Year 14
Table 6: Expenditures by Federal Fiscal Year 15
Table 7: Role and Level of Effort of Research Team Members by Task 16
Table 8: Summary of Commitments for Principal Investigator 16

PROBLEM STATEMENT

The rapid economic growth in the state of Montana makes it critical for the state to have adequate up-to-date geographic information infrastructure. Such infrastructure would increase the accuracy of geographic information and maps that are needed by multiple users from private and public entities. The Montana Department of Transportation (MDT) and the State Library are leading an effort to develop a Statewide Global Navigation Satellite System (GNSS) Real-Time Network (RTN). A statewide GNSS-RTN benefits multiple public and private entities that utilize GPS survey and GIS mapping services. Geographic Information Systems (GIS) mapping, survey grade applications, precision agriculture, emergency management, construction engineering projects, infrastructure asset management, environmental studies, municipal infrastructure, and navigation are only some of the important applications of the prospective statewide GNSS-RTN system. This system should cover most or all of Montana geographic area and provides survey grade RTN survey and mapping services to various public and private network partners while following a fiscally sustainable business operation. Research is needed to investigate the feasibility of different business models for sustainable operation and maintenance of a statewide GNSS-RTN system to inform the direction of the state's efforts in developing and maintaining a statewide GNSS-RTN. Research findings should help the MDT and other state partners make sound decisions regarding the main aspects of the system such as access to network services and ownership, operation, and maintenance of RTN components including Continuously Operating Reference Stations (CORS), the Central Processing Center (CPC) and network communications.

BACKGROUND SUMMARY

The GNSS-RTN or real time networks is a satellite-based positioning system using a network of ground receivers (also called base stations, reference stations or CORS) to improve the precision of geospatial positioning through real-time corrections sent from a central processing center to a roving user. The real time GNSS networks have been increasingly used in the US for the many benefits and applications where high-precision geospatial location data is needed.

The MDT and the State Library are leading an effort to develop a Statewide GNSS-RTN system. A statewide RTN benefits multiple public and private entities that utilize Global Positioning System (GPS) survey and Geographic Information System (GIS) mapping services. Users can realize increased efficiencies and cost savings in the form of reduced equipment and field hours performing field surveys. Infrastructure and assets can be efficiently inventoried and mapped. The GPS automated machine control used in precision farming and other applications is supported. For those and other applications, data across all users of a network can be connected.

The MDT and the State Library are collaborating in a planning effort to identify and resolve technical planning and design issues for the implementation and operation of a statewide GNSS-RTN. As of 2019, Montana had five GNSS-RTN pilot projects consisting of five subnetworks that are currently being hosted by the Washington State Reference Network (1). These pilot subnetworks are comprised of stations constructed via the memorandum of understanding between the MDT and the native tribes living on Blackfeet, Fort Peck, and Fort Belknap reservations as well as stations constructed by other parties. Currently, Blackfeet, Fort Peck and Fort Belknap reservations each have a subnetwork operating under the Montana RTN pilot project.

The MDT completed a gap analysis (2) identifying multiple RTN development, operation and maintenance business models for further investigation and analysis. As more base stations are being planned and subnetwork expansions are being considered, research into the various alternative business models is timely and much needed to inform the planning efforts for the development of the statewide RTN. This research should examine in detail the feasibility of different business models for sustainable operation and maintenance of a statewide RTN that would consider access to network services and ownership, operation, and maintenance of RTN components including the CORS, the CPC and network communications.

BENEFITS AND BUSINESS CASE

A number of benefits are expected to result from this research. MDT will benefit from the knowledge gained from the state of the practice screening by potentially learning of new opportunities and methods related to the planning and development of the statewide GNSS-RTN. The analysis of business models and project recommendations should help the MDT and the State of Montana satisfy the increasing need of geospatial data in a myriad of applications that collectively support the economic growth in the state and the wellbeing of its citizens. An Implementation plan with recommendations and guidelines will help the MDT ensure an optimal use of agency resources regarding the ownership and operation of the statewide GNSS-RTN.

OBJECTIVES

The objective of this project is to perform an assessment of the various alternative business models and to recommend to Montana MDT (and other partners) the most appropriate business model(s) to pursue in the planning and development of a statewide GNSS-RTN system. The prospective statewide GNSS-RTN should cover all or most of Montana geographical area and follow a fiscally sustainable business operation. More specifically, this project will gain understanding of and document the state of the art and practice related to GNSS-RTN existing systems, analyze the advantages and limitations of using various business models in the context of the state of Montana, and develop implementation recommendations to guide the planning efforts by MDT and other partners regarding the development and operation of Montana GNSS-RTN.

RESEARCH PLAN

The research plan requires the completion of nine tasks in order to achieve the objectives of the project. These tasks are:

1. Project Management
2. Literature Review
3. State of the Practice Assessment
4. Characterize Montana GNSS-RTN Existing Infrastructure
5. Catalog and Select Viable Business Models for Statewide GNSS-RTN
6. Evaluate Business Models and Recommend Most Appropriate
7. Final Report
8. Performance Measures Report
9. Implementation Report

1.0 Project Management

Project Management is essential to ensure a successful project and efficient communication between WTI and MDT. Specific project management activities include:

- A kickoff meeting with the project Technical Panel to occur as soon as practical after a contract is in place. The Technical Panel and the WTI team will discuss the research approach to be taken (as laid out in this section of the proposal), potential information sources and agency contacts, and other items that could assist WTI in executing the project.
- Quarterly progress reports delivered to MDT assessing work accomplished on specific tasks and the percent of each task completed to date.
- Meeting with the project technical panel in person or via video or phone conference at any time during the life of the project. Request for such meetings could be initiated by the research team or the project Technical Panel Chair.
- A final meeting (in person or via video/phone conference) to present the results of the research to the Technical Panel (following a final report review and comment period), if such a meeting is desired and requested by the panel. This would serve to conclude the project, presenting and discussing the findings of the project. This meeting often coincides with the implementation meeting.

2.0 Literature Review

This task will involve an in-depth screening and review of the literature and other available information pertaining to using GNSS-RTN in the United States and internationally. This review will involve different aspects of the existing GNSS-RTN systems including the business model adopted for providing the service, various users and applications, and system characteristics that are important in determining the development and operational costs of the system (e.g. CORS stations spacing, targeted precision, type of CORS installation, etc.). The approach taken in completing this task will employ a comprehensive literature search through sources including, but not limited to, Sage, ScienceDirect, the Transport Research International Documentation (TRID) database and websites for agencies such as the National Geodetic Survey (NGS), the US Geological Survey (USGS), the Federal Highway Administration (FHWA), Transportation

Research Board (TRB), state DOTs, and other organizations. Sources of information may include peer-reviewed papers and journal articles, agency reports, agency websites, and other relevant documentation and information, including those posted on manufacturers websites. Results from this task will be included in a report submitted to MDT at the conclusion of this task. This task will be updated to consider any new information that may have been published during the life of the project at the time of preparing the final report.

3.0 State-of-the-Practice Assessment

The goal of this task is to screen the current practice in providing the GNSS-RTN location service in different states around the country. To achieve this goal, the research team plans on developing an online survey tool, sending out the survey to respective RTN operators/administrators, and analyzing survey results. The survey will include aspects as it pertains to the availability of the GNSS-RTN service, RTN ownership and business model, system attributes including CORS types, spacing, and precision of location data, etc. The survey tool will be reviewed, revised as needed, and ultimately approved by the Technical Panel prior to use to ensure the results reflect the most important information in relation to the development of Montana GNSS-RTN system. The research team will seek the help of the project technical panel in compiling the list of contacts in other states to be used in the survey. The survey will be administered using an online tool (such as Qualtrics or SurveyMonkey), with follow-up email or phone calls as necessary.

Based on the results of the state DOT survey and/or published literature, the research team may also need to contact one or more agencies using phone interviews to obtain more in-depth information about their GNSS-RTN systems regarding aspects such as:

- The fiscal sustainability of existing systems including cost distribution among users and stakeholders
- Main users, beneficiaries and stakeholders
- The agency administrative resources dedicated to running the system
- Interagency agreements and public-private partnerships when applicable
- Etc.

Finally, the research team will solicit input from the main GNSS-RTN manufacturers and vendors to obtain more precise information about the costs and technologies involved in system development and to gain more accurate information about the different ways these vendors provide service to different RTN operators. The RTN industry input is needed for two reasons: 1) the practice survey discussed above is not expected to provide information for all agencies targeted by the survey, as the response rate in similar surveys is usually well below 100%, and 2) the information provided by state agencies may not reflect the most recent products and associated costs as many of the GNSS-RTN systems were developed at different times and may not reflect the current state of technology and current market. The research team plans to obtain the information from the main manufacturers/vendors offering service in the United States such as Trimble, TopCon, NavCom, Thales and Leica. Any published information including manufacturers' websites will be gathered first, and missing information will be identified and acquired from manufacturers using phone interviews, or other appropriate means.

The current state of practice will be documented throughout this task and included in a report at the conclusion of this task.

4.0 Characterize Montana GNSS-RTN Existing Infrastructure

In this task, all existing infrastructure that are used in providing GNSS location service in the state of Montana will be inventoried and documented. Further, the use of the existing infrastructure and how it fits in the future statewide GNSS system will also be assessed in this task.

5.0 Catalog and Select Viable Business Models for Statewide GNSS-RTN

Using results from Tasks 2 and 3, the research team will catalog / document all business models that are used in the current domestic or international practice for providing GNSS-RTN geospatial location service. The pros and cons of these business models will be discussed considering variables such as system access and RTN ownership, operation, and maintenance as well as service costs and user fees. Different for-profit and cost-recovery fee structures will be explored in this task considering the initial investment and the long-term costs of the prospective statewide GNSS-RTN system. The most favorable business models will be identified and selected for further consideration and analysis in Task 7. Given the geographic context of the state, the current GNSS infrastructure and potential system applications/users, a few alternative GNSS-RTN systems will be identified for further consideration and evaluation in the following task.

6.0 Business Model Evaluation for Future Montana GNSS alternative Systems

In this task, the future statewide GNSS-RTN system in Montana will be evaluated using the alternative business models identified in task 5 and the various service attributes, as applicable (geographic coverage, geospatial data precision, etc.). As deemed appropriate, quantitative and/or qualitative assessment of different scenarios will be considered in this task. A good understanding of all existing and potential users of the prospective system (both public and private entities / partners) is important for the evaluation conducted in this task. The most viable (fiscally sustainable) business model for providing statewide GNSS-RTN location service is identified and recommended. An interim report summarizing the findings from tasks 4, 5 and 6 will be submitted to the MDT at the conclusion of this task.

7.0 Performance Measures Report

This task involves the development of the performance measures report which highlights the value of the research (and its products) to the MDT and other users in the state. The proposed business model for providing statewide GNSS-RTN service will be assessed for merits and benefits to the MDT and other users in the state. The assessment may be qualitative or quantitative and may involve an economic analysis (e.g. benefits-to-cost analysis) should the required inputs to the analysis be deemed reasonably quantifiable. The results of the assessment will be included in the final project report as well as in a separate report submitted to the MDT.

8.0 Final Report

This task will include the preparation and submission of the final report. The final report will include the findings from all prior tasks as well as any recommended actions stemming from these tasks. The section on Task 2.0 results (state of the art review) will include updated information to reflect new studies or reports that may have been published during the duration of the project. A draft of the final report will be provided to the Technical Panel two (2) months prior to the completion of the project. This will allow enough time for the report to be reviewed by the Technical Panel and comments/suggestions be incorporated in the final report draft in a timely

manner. If the Technical Panel desires a final project meeting, then presentation materials for that meeting will also be prepared and provided to the research project manager in advance of the meeting date.

9.0 Implementation Report

The implementation report, which is prepared separate from the final report, will include recommendations and guidelines that will assist the MDT in the implementation of the future statewide GNSS-RTN system. The research team will meet with the project technical panel and discuss the various measures and recommendations that are deemed necessary for the implementation of the prospective system. During the meeting, the technical panel will respond to the various recommended measures with action plan as deemed necessary and feasible by the project panel. The research team will prepare the implementation report, which include the action plan agreed upon during the implementation meeting and submit the report to the research project manager at the conclusion of this task.

MDT INVOLVEMENT

MDT involvement in this project will be required as follows:

- The Technical Panel will need to provide input, feedback and guidance on the research plan at the kick-off meeting and on as-needed basis afterwards whenever change or modification to the research plan is deemed appropriate by the research team or the panel.
- MDT staff will be asked to field information and data requests on an as needed basis. The two main items currently envisioned to require Technical Panel involvement include the identification of contact persons for the GNSS-RTN operators in other states (for the State of the Practice survey purposes) as well as any unpublished information on the Montana GNSS-RTN infrastructure. Further, the Panel may be required to clarify information in the background documents submitted to the research team prior to the proposal stage.
- The Technical Panel will review and provide comments and feedback on project deliverables including the final report.

PRODUCTS

The primary products resulting from this work are described below.

- Quarterly progress reports will be submitted documenting the work accomplished on specific tasks and the percent of each task completed to date.
- Task reports documenting the findings from different tasks as outlined in the proposed research plan.
- Draft and final surveys will be provided to the Technical Panel for review prior to use in the State of the Practice survey that will query contacts from other RTN administrators / operators.
- A draft final report that presents the results of the overall research effort will be provided to the Technical Panel for review and comment. The Technical Panel's comments will then be addressed, and the report re-submitted in as a Final Report. The report will be delivered in both Microsoft Word and Adobe PDF formats and will comply with the MDT's report requirements.
- A performance measures report detailing value of the research products and the major benefits to MDT and other partners.
- An implementation report, with content (text and images) provided by the researchers formatted and published by MDT, detailing any implementation recommendations stemming from the project.
- A final report cover page photo (JPG format).
- A Project Summary Report containing a high-level overview of the project and findings from the assessment.
- Project poster
- Contingent upon the desires of the Technical Panel, a Final Report Presentation and/or implementation meeting will be provided and could either be in-person at MDT Headquarters in Helena, or via teleconference.
- Project webinar

IMPLEMENTATION

The implementation report included as a stand-alone report will detail the specific recommendations and guidelines for MDT and other partners to consider in the planning and development of Montana statewide GNSS-RTN system. This plan will be made available to MDT personnel and other state partners who are involved in the operation and management of the GNSS data in Montana. In addition, the research team will likely also disseminate finding from this assessment to broader audiences, and other interested states via publication in relevant journals and presenting the findings at professional meetings.

SCHEDULE

Table 1 shows the individual task schedules and timeline. This project is expected to take 18 months to complete.

Table 1: Project Schedule

Task	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Project Management				◆			◆			◆			◆			◆		
2. Literature Review				▲														
3. State of the Practice Review						▲												
4. Characterize MT GNSS Infrastructure																		
5. Catalog and Select Business Models						↑		↑										
6. Evaluate Business Models									↑	↑			▲					
7. Performance Measures Report											↑				▲			
8. Final Report																▲		
9. Implementation Report																		▲

◆ Quarterly progress report
▲ Deliverable
↑ Decision meeting
↑ Touch point meeting

BUDGET

This project is funded by the Montana Department of Transportation (MDT) and the Small Urban, Rural and Tribal Center on Mobility (SURTCOM) at the Western Transportation Institute (WTI). The total cost of this project will be $144,501 as summarized in Table 2. This cost includes all allocated research and support staff time, and other anticipated expenses. The budget involves $8,000 tuition for the graduate research assistant and $2,450 travel expenses intended for 3-4 trips to MDT offices in Helena (during the life of the project) and one conference trip (e.g. TRB Annual Meeting). The total budget is split between the MDT ($74,991) and SURTCOM ($69,510).

Table 2: Summary of Cost by Budget Category

Item	Amount
Salaries	$79,101
Benefits	$18,412
Travel	$2,450
3-4 trips to Helena ($450)	
TRB Trip ($2000)	
Expendable Supplies	$300
GRA Tuition	$8,000
Total Direct Cost	$108,264
Indirect Cost	$36,237
Total Project Cost	**$144,501**

MDT BUDGET

The total MDT budget for this project is $74,991 as shown in Table 3. Projected expenditures by task are shown in Table 4. Further, projected expenditures by state and federal fiscal years are shown in Tables 5 and 6, respectively.

Table 3: Summary of Cost by Budget Category – MDT Project Budget

Item	Amount
Salaries	$41,737
Benefits	$9,506
In-state Travel	$450
3-4 trips to Helena ($450)	
Expendable Supplies	$300
GRA Tuition	$8,000
Total Direct Cost	$59,993
Indirect Cost	$14,998
Total Project Cost	**$74,991**

Table 4: Cost by Task

Task	Cost	% of Total Cost
Task 1: Project Management	$7,180.00	9.6%
Task 2: Literature Review	$15,236.70	20.3%
Task 3: State of the Practice Screening	$8,399.80	11.2%
Task 4: Characterize MT GNSS Infrastructure	$6,715.40	9.0%
Task 5: Catalog and Select Business Models	$11,985.00	16.0%
Task 6: Evaluate Business Models	$8,227.90	11.0%
Task 7: Performance Measures Report	$5,744.30	7.7%
Task 8: Final Report	$5,489.90	7.3%
Task 9: Implementation Report	$6,012.10	8.0%
Total	**$74,991.10**	**100.0%**

Table 5: Expenditures by State Fiscal Year

Budget Category	Total	State Fiscal Year	
		2021	2022
Salaries	$41,736.94	$22,955.31	$18,781.62
Benefits	$9,505.94	$5,228.27	$4,277.67
Supplies & Minor Equipment	$300.00	$150.00	$150.00
Travel	$450.00	$150.00	$300.00
Tuition	$8,000.00	$4,000.00	$4,000.00
Direct Costs	$59,992.88	$32,483.58	$27,509.30
Indirect Cost	$14,998.22	$8,120.90	$6,877.32
Total Project Cost	$74,991.10	$40,604.48	$34,386.62

Table 6: Expenditures by Federal Fiscal Year

Budget Category	Total	Federal Fiscal Year	
		2021	2022
Salaries	$41,736.94	$29,215.86	$12,521.08
Benefits	$9,505.94	$6,654.16	$2,851.78
Supplies & Minor Equipment	$300.00	$150.00	$150.00
Travel	$450.00	$300.00	$150.00
Tuition	$8,000.00	$8,000.00	$0.00
Direct Costs	$59,992.88	$44,320.02	$15,672.86
Indirect Cost	$14,998.22	$11,080.00	$3,918.22
Total Project Cost	$74,991.10	$55,400.02	$19,591.08

STAFFING

The research team is composed of the Principal Investigator, Dr. Ahmed Al-Kaisy along with one graduate student researcher. A short biography of the Principal Investigator is provided below.

Ahmed Al-Kaisy, PhD, PE, is a professor in the Department of Civil Engineering at Montana State University (MSU) and the Program Manager for the Safety and Operations Focus Area at the Western Transportation Institute (WTI). Dr. Al-Kaisy has long teaching and research experience in many areas of transportation engineering, including traffic operations and management, traffic flow theory, traffic safety, transportation system management, signal optimization and control, highway design, and intelligent transportation systems. Further, Dr. Al-Kaisy has previously worked with the MDT on projects involving system planning and management such as the Montana RWIS Assessment project, a project on the ATR and WIM stations at the state level, and a project that investigated rest area usage throughout the state of Montana. He has authored/co-authored more than a hundred refereed publications half of which are fully refereed journal articles. Dr. Al-Kaisy is an active member in many university committees and is affiliated with a number of national and international professional organizations. Dr. Al-Kaisy is a registered professional engineer in the state of Montana. The resume for the Principal Investigator is provided at the end of this proposal.

The primary role of team members on this project and their level of effort are delineated by task in Table 8.

Table 7: Role and Level of Effort of Research Team Members by Task

Name or Title	Role in Study	Task									
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Ahmed Al-Kaisy	Principal Investigator	120	56	72	72	78	96	64	66	62	**686**
Graduate Student	Data Collection & Analysis	0	400	272	230	180	153	200	100	120	**1655**
Business Manager	Administrative Support	0	4	0	4	0	2	0	2	4	**16**
Support Staff	Technical editing	0	8	8	0	0	10	8	0	28	**62**
	Total Hours	**120**	**468**	**352**	**306**	**258**	**261**	**272**	**168**	**214**	**2419**

The key investigators can commit the time necessary to complete this work in a timely and deliberate manner as shown in Table 9. The level of effort proposed for the principal investigator will not be changed without written consent of MDT.

Table 8: Summary of Commitments for Principal Investigator

Individual	Available Time %	Existing Commitments	
		Commitment	Time, %
Ahmed Al-Kaisy	40	Teaching	40
		MDT LVR Safety Project	15
		Other	5

FACILITIES

The Western Transportation Institute (WTI) is the nation's largest transportation institute focusing on rural transportation issues. The Institute was established in 1994 by the Montana and California Departments of Transportation, in cooperation with Montana State University. WTI has an annual budget exceeding $7 million and a 50-person multidisciplinary staff of professionals, students and associated faculty from engineering (mechanical/industrial/civil), computer science, fish and wildlife, ecology, business, and economics. WTI has conducted research in more than 30 states, at local, state, and federal levels.

As a department in the College of Engineering, WTI is also supported by the College and by the umbrella of MSU administrative, academic, and research resources. The research faculties at WTI are assisted by a backbone of support staff. Administrative staff helps with budgeting, procurement, contracts, and accounting. Communications staff provides technical editing, layout, graphic design, and web page support. Information Technology staff maintains network servers and individual computers, software and hardware. Given the nature of this research project, most of the work will be data/information gathering, analysis, and assessment. The research will be conducted on pc/workstations using software available at WTI and the Civil Engineering Department of the College of Engineering at Montana State University.

REFERENCES

1. 2018 Governor's Tribal Relations Report – Agency Narrative Reporting Form (for the Reporting Period July 1, 2018 - June 30, 2019). (Unpublished)

2. Montana Department of Transportation Highways Bureau, (2019) "Montana Global Navigation Satellite System Real-Time Network Gap Analysis." Helena, Montana. (Unpublished)

Revision Date:
February 1, 2020

Ahmed Al-Kaisy, Professor
Department of Civil Engineering
Montana State University
Bozeman, Montana 59717
Phone: (406) 994-6116
Email: alkaisy@montana.edu

ACADEMIC PREPARATION

Post-Doctoral Fellow, McMaster University, Hamilton, Ontario, Canada	1999-2000
PhD Transportation Engineering, Queen's University, Kingston, Ontario, Canada	1999
BSc, MSc Civil Engineering, University of Baghdad, Iraq	1985

ACADEMIC EMPLOYMENT

Professor, Department of Civil Engineering, Montana State University, Bozeman, Montana, July 2012-present.

Program Manager, Safety & Operations, Western Transportation Institute, Montana State University, Bozeman, Montana, June 2008-present

Visiting Professor, Department of Civil Engineering, American University of Sharjah, UAE, September 2011-June 2013

Associate Professor, Department of Civil Engineering, Montana State University, Bozeman, Montana, July 2007-July 2012.

Assistant Professor, Department of Civil Engineering, Montana State University, Bozeman, Montana, 2003-2007

Assistant Professor, Civil Engineering Department, Bradley University, Peoria, IL 2001-2003

Post-Doctoral Research Associate, McMaster University, Hamilton, Ontario, Canada 1999-2000

Lecturer, McMaster University, Hamilton, Ontario, Canada 1999-2000

Research Associate, Royal Military College of Canada, Kingston, Ontario, Canada 1996-1999

Research Assistant, Queen's University, Kingston, Ontario, Canada 1996-1999

Teaching Assistant, Queen's University, Kingston, Ontario, Canada 1996-1999

RESEARCH GRANTS

- *Use of Fluorescent Orange Delineators in Temporary Traffic Control Work Zones*, Montana Department of Transportation and SURTCOM (Principal Investigator), $204,000 (in contract). Information at: https://rip.trb.org/View/1530033

- *Developing a Methodology for Safety Improvements on Low-Volume Roads in Montana*, Montana Department of Transportation and SURTCOM (Principal Investigator), $127,000 (ongoing).
- *Downtown Bozeman Parking Inventory and Occupancy Study*, City of Bozeman (Principal Investigator), $30,000 (Completed)
- *Improved Analysis of Two-Lane Highway Capacity and Operational Performance*, National Cooperative Highway Research Program (NCHRP), $550,000 (Investigator, PI: Scott Washburn, University of Florida), (completed)
- *Developing Interdisciplinary Research Initiatives on Smart Cities*, COE Thorson Excellence in Engineering (TEER) Grants program & WTI SURTCOM (Co-PI), $56,000 (completed)
- *Feasibility of Electric, Autonomous Paratransit Service in Rural Areas - Smart Cities Initiative*, Small Urban, Rural and Tribal Center on Mobility (SURTCOM), Western Transportation Institute (PI), $77,241 (ongoing)
- *Assessment of Montana Road Weather Information System (RWIS)*, Montana Department of Transportation (Principal Investigator), $152,000 (completed)
- *Traffic Records and Performance Measure Support*, National Highway Traffic Safety Administration (NHTSA), $182,000 (Co-Principal Investigator, PI: Eric Li from Virginia Tech, prime institution) (completed)
- *Innovative Safety Solutions with Pavement Markings and Delineation*, American Traffic Safety Services Association (ATSSA), (Principal Investigator), $30,000 (completed)
- *Risk Factors Associated with High Potential for Serious Crashes*, Oregon Department of Transportation and FHWA, $160,000 (Principal Investigator), (completed)
- *Evaluation of Variable Speed Limit/Variable Advisory Speed Systems*, Oregon Department of Transportation and FHWA, $165,000 (MSU PI, in partnership with Portland State University, PSU PI: Dr. Robert Bertini) (completed)
- *Montana Weigh-in-Motion (WIM) and Automatic Traffic Recorder (ATR) Strategy*, Montana Department of Transportation and FHWA (Investigator), $205,000 (completed)
- *Traffic Calming for Rural 2-Lane Roads*, Central Federal Land Highway Division, FHWA (Principal Investigator), $80,000 (completed)
- *Evaluation of a Variable Speed Limit System for Wet and Extreme Weather Conditions*, Oregon Department of Transportation and FHWA, (Principal Investigator), $170,000 (phase I completed)
- *Cost Effective Local Road Safety Planning and Implementation*, American Traffic Safety Services Association (ATSSA), (Co-Principal Investigator), $35,000 (completed)
- *Montana Rest Area Usage: Data Acquisition and Usage Estimation*, Montana Department of Transportation, (Principal Investigator), $160,000 (completed)
- *Explore ITS Technologies for Work Zones and Work Zone Impact Areas*, Western Federal Land Highway Division, FHWA (Principal Investigator), $120,000 (completed)

- *Effect of Speed, Alignment and Roadside Features on Crash Experience along a Rural Corridor*, Western Transportation Institute, NSF REU Program, $12,000 (completed)
- *City of Bozeman Parking Study*, City of Bozeman, (Principal Investigator), $28,000 (completed)
- *Effect of Alignment and Sight Distance on Drivers' Speed Selection in the Gallatin Canyon*, Western Transportation Institute, NSF REU Program, $12,000 (completed)
- *Channelized Right-Turn Lanes at Signalized Intersections: Traffic Control Empirical Investigation*, US Department of Transportation through Western Transportation Institute, Bozeman, MT, (Principal Investigator), $25,000 (completed)
- *FWS Traffic Monitoring Assessment and Demonstration Project – Phase I*, Central Federal Lands Highway Division, FHWA, (Principal Investigator), $100,000 (completed)
- *Operational Effectiveness of Passing lanes on Two-Lane Highways*, Western Transportation Institute, UTC Graduate Transportation Award, Bozeman, MT, $69,500 (completed)
- *Use of Rural Transportation Infrastructure in Evacuation Operation for the North Gulf Coastal Region*, Center for Urban Rural Interface Studies, Mississippi State University, National Oceanic and Atmospheric Administration (NOAA), (Co-Principal Investigator), $75,000 (completed)
- *Bozeman Pass Wildlife Channelization ITS Project*, Federal Highway Administration and Montana Department of Transportation, (Co-Investigator), $82,498 (completed)
- *Indicators of Performance on Two-Lane Highways*, Western Transportation Institute, UTC Graduate Transportation Award, $69,500 (completed)
- *Effectiveness of Yield-to-Pedestrian Channelizing Devices*, Pennsylvania Department of Transportation, (Co-Investigator), $50,000 (completed)
- *Development of New Analysis Procedures for Two-Lane Highways*, Western Transportation Institute, UTC Graduate Transportation Award, $47,000 (completed)
- *Static Warning Signs for Occasional Hazards: Survey of Practice*, University Transportation Center, US Department of Transportation through the Western Transportation Institute, Bozeman, MT, (Principal Investigator), $25,000 (completed)
- *The Intelligent Transportation System Lab*, Econolite and MSU, $156,000 (completed)
- *Weather Responsive Signal Control: Practical Guidelines*, Western Transportation Institute, NSF REU Program (completed)
- Single-Lane Two-Way Traffic Control at Maintenance & Reconstruction Zones, Western Transportation Institute, NSF REU Program, $12,000 (completed)
- *A New Approach for Developing Passenger Car Equivalency Factors for Heavy Vehicles on Congested Freeways*, Graduate Research Assistant Sponsored Project Award (GRASP), $35,000 (completed)
- *Nighttime Construction: Evaluation of Construction Operations*, Illinois Transportation Research Center (ITRC), Springfield, Illinois, (Co-Principal Investigator), $150,000 (completed)

- *Nighttime Construction: Evaluation of Lighting for Highway Construction*, Illinois Transportation Research Center (ITRC), Springfield, Illinois, (Co-Principal Investigator), $150,000 (completed)
- *Assessing the Occlusion Effect of Heavy Vehicles on the Visibility of Freeway Guide Signs*, Graduate Research Assistant Sponsored Project Award (GRASP), $35,000 (completed)
- *Assessing the Effect of Peak Hour Factor Approximation on Intersection Delay*, Bradley University Caterpillar Faculty Fellowship, $25,000 (completed)
- *Freeway Capacity at Long-Term Reconstruction Zones*, Natural Sciences and Engineering Research Council of Canada (NSERC), (Investigator), (completed)
- *Quality of Service on Freeway facilities*, Natural Sciences and Engineering Research Council of Canada (NSERC), (Investigator), (completed)

PUBLICATIONS

Book Chapters

The Highway Capacity Manual (HCM) Two-Lane Highway Analysis Methodology – New chapter in the upcoming HCM update – NCHRP project 17-65.

Refereed Journal Articles

1. Al-Kaisy, A., Ewan, L., and **Hossain, F**[1]**.** (2019) "Identifying Candidate Locations for Safety Improvements on Low-Volume Rural Roads: The Oregon Experience," Transportation Research Records, Journal of the Transportation Research Board, Volume 2673, issue 12, https://doi.org/10.1177/0361198119853549.
2. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2019) "Evaluation of passing lane effective length on two-lane highways," Transportation Letters, DOI: 10.1080/19427867.2019.1586329.
3. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2019) "Passing Lane Optimum Length on Two-Lane Highways," Canadian Journal of Civil Engineering (CJCE), 46 (6), pp. 261-269.
4. Al-Kaisy, A., **Jafari, A**., and Washburn, S. (2019) "Following Status and Percent Followers on Two-Lane Two-Way Highways: Empirical Investigation," Civil Engineering Research Journal, Juniper Publishers, 2019; 7(3): 555711. DOI: 10.19080/CERJ.2019.07.555711.
5. **Jafari, A.**[2] and Al-Kaisy, A. (2018) "Investigation of Side-by-Side Passing Lane Length and Spacing on Two-Lane Highways" Journal of Advances in Transportation Studies, XLVI (November 2018), pp. 31-42, DOI: 10.4399/97882551864l3.
6. Al-Kaisy, A., **Jafari, A.**, Washburn, S., Luttinen, T. and Dowling, R. (2018) "Performance Measures on Two-Lane Highways: Survey of Practice," Research in Transportation Economics, Elsevier, Volume 71, pp. 61-67.

[1] Names in bold indicate supervised graduate students.
[2] Names in bold indicate supervised graduate students.

7. Al-Kaisy, A., **Jafari, A.**, and Washburn, S., Luttinen, T. and Dowling, R. (2018) "Traffic Operations on Rural Two-Lane Highways: a Review on Performance Measures and Indicators," Transportation Research Records, Journal of the Transportation Research Board, Sage Publications, Volume 2672, Issue 15, pp. 66-74.
8. Al-Kaisy, A., and Ewan, L. (2017) "Prioritization Scheme for Proposed RWIS Sites: Montana Case Study," Transportation and Transit Systems: *Frontiers in Built Environment*, 3:45. doi: 10.3389/fbuil.2017.00045.
9. Al-Kaisy, A., **Jafari, A.,** and Washburn, S. (2017) "Measuring Performance on Two-Lane Highways: Empirical Investigation," *in Transportation Research Record 2615*, Journal of the Transportation Research Board, DOI is 10.3141/2615-08.
10. Al-Kaisy, A., ***Miyake, G.***[3], Stasczuk, J., and Scharf, D. (2016) "Motorists' Voluntary Yielding of Right of Way at Uncontrolled Mid-Block Crosswalks with Rectangular Rapid Flashing Beacons*" Journal of Transportation Safety and Security*, ISSN: 1943-9962 (Print) DOI: 10.1080/19439962.2016.12- -67827.
11. Al-Kaisy, A., Ewan, L., and **Hossain, F.** (2016) "Economic Feasibility of Safety Improvements: Oregon's Low-Volume Roads Case Study," *Journal of Transportation Safety and Security*, Taylor & Francis, ISSN: 1943-9962 (Print) 1943-9970 (Online), DOI: 10.1080/19439962.2016.1212446, pp. 1-14.
12. Ewan, L., Al-Kaisy, A., and **Hossain, F.** (2016) "Safety Effects of Road Geometry and Roadside Features on Low-Volume Roads," *Transportation Research Record 2580*, Journal of the Transportation Research Board, pp. 47-55.
13. Wang, Y., Veneziano, D., Russel, S. and Al-Kaisy, A. (2016) "Traffic Safety along Tourist Routes in Rural Areas," *Transportation Research Record 2568*, Journal of The Transportation Research Board, pp.55-63.
14. Ismeik, M., Al-Kaisy, A. and Al-Ansari, K. (2015) "Perceived Risk of Phoning while Driving: a Case Study from Jordan," *Journal of Safety Science*, Elsevier, volume 78, pp. 1-10.
15. ***Watson, D.***, Al-Kaisy, A. and ***Anderson, N.*** (2014) "Examining the Effect of Speed and Roadway Geometry on Crash Experience along a Rural Corridor," *Journal of Modern Transportation*, Springer, Vol. 22, Issue 2, pp. 84-95.
16. Al-Kaisy, A., ***Krieder, T and Pothering, R.*** (2013) "Speed Selection at Sites with Restrictive Alignment: The US-191 Case Study," *Journal of Advances in Transportation Studies*, Issue 29. pp. 71-82.
17. **Ewan, L.**, Al-Kaisy, A. and Veneziano, D. (2013) "Weather Sensing and Road Surface Conditions: Is Technology Mature for Reliable ITS Applications?" *TRB Transportation Research Record 2329*, Journal of the Transportation Research Board, pp. 8-16.
18. **Freedman, Z.** and Al-Kaisy, A. (2013) "Investigation of Performance and Lane Utilization within a Passing Lane on a Two-Lane Rural Highway" *The International journal for Traffic and Transport Engineering*, Vol. 3, issue 3, pp. 279-290.
19. Al-Kaisy, A., Veneziano, D. Dorrington, C., and **Kirkemo, Z.** (2012) "Practical Guidelines for Estimation of Rest Area Use on Rural Interstates and Arterial Highways" *Transportation Research Record 2303*, Journal of the Transportation Research Board, pp. 117-124.
20. Al-Kaisy, A. and **Roefaro, S.** (2012) "Channelized Right-Turn Lanes at Signalized Intersections: The U.S. Experience," *Advances in Transportation Studies*, Vol. 26, pp.57-68.

[3] Names in bold italic indicates supervised undergraduate students.

21. Al-Kaisy, A., **Roefaro, S.** and Veneziano, D. (2012) "Effectiveness of Signal Control at Channelized Right Turning Lanes: An Empirical Study" *Journal of Transportation Safety and Security*, Vol. 4, Issue 1, pp. 19-34.
22. Al-Kaisy, A., **Church, B.**, Veneziano, D. and Dorrington, C. (2011) "Investigation of Parking Dwell Time at Rest Areas on Rural Highways," *Transportation Research Record 2255*, Journal of the Transportation Research Board, pp. 156-164.
23. Al-Kaisy, A., **Kirkemo, Z.**, Veneziano, D. and Dorrington, C. (2011) "Traffic Usage of Rest Areas on Rural Highways: A Recent Empirical Study" *Transportation Research Record 2255*, Journal of the Transportation Research Board, pp. 146-155.
24. Al-Kaisy, A. and **Freedman, Z.** (2011) "Estimating Performance on Two-Lane Highways: Case Study Validation of a New Methodology," *Transportation Research Record 2173*, Journal of the Transportation Research Board, pp. 72-79.
25. **Freedman, Z.** and Al-Kaisy, A (2010) "Empirical Examination of Passing Lane Operational Benefits on Rural Two-Lane Highways," *Journal of Transportation Research Forum*, Vol. 49, No. 3, pp. 53-68.
26. Al-Kaisy, A. and **Karjala, S.** (2010) "Car-Following Interaction and the Definition of Free-Moving Vehicles on Two-Lane Rural Highways." *Journal of Transportation Engineering*, ASCE Publications, Vol.136, Issue 10, pp. 925-931.
27. Ismeik, M. and Al-Kaisy, A. (2010) "Characterization of Cell Phone Use while Driving: The Jordan Experience," *Transport*, Taylor & Francis, Vol. 25, Issue 3, pp. 252-261.
28. Al-Kaisy, A., and Nassar, K. (2009) "Developing a Decision Support Tool for Nighttime Construction in Highway Projects" ASCE *Journal of Construction Engineering & Management*, Volume 135, Issue 2, pp. 119-125.
29. Al-Kaisy, A. and **Durbin, C.** (2009) "Platooning on Two-Lane Two-Way Highways: An Empirical Investigation" *Journal of Advanced Transportation*, Volume 43, Number 1, pp. 71-88.
30. Al-Kaisy, A. and **Karjala, S.** (2008) "Indicators of Performance on Two-Lane Rural Highways: An Empirical Investigation" *In Transportation Research Record 2071*, Journal of the Transportation Research Board, pp. 87-97.
31. Nassar, K. and Al-Kaisy, A. (2008) "A Discrete Event Simulation Model for the Effect of Placement Location on Sign Occlusion in Buildings" *Journal of Automation in Construction*, Elsevier, Volume 17, issue 7, pp. 799-808.
32. Al-Kaisy, A. and **Durbin, C.** (2008) "Evaluating New Methodologies for Estimating Performance on Two-Lane Highways" Canadian Journal of Civil Engineering, Volume 35, Number 8, pp. 777-785.
33. Al-Kaisy, A., Hardy, A., and ***Nemfakos, C.*** (2008) "Static Warning Signs of Occasional Hazards: Do They Work?" The Institute of Transportation Engineers, *ITE journal*, pp. 38-42, June 2008.
34. Rakha, H., Ingle, A., Hancock, K., and Al-Kaisy, A. (2007) "Estimating Truck Equivalencies for Freeway Sections" *In Transportation Research Record 2027*, Journal of the Transportation Research Board, pp. 73-84.
35. Al-Kaisy, A. and ***Freedman, Z.*** (2006) "Weather Responsive Signal Control: Practical Guidelines," *In Transportation Research Record 1978*, Journal of the Transportation Research Board, pp. 49-60.

36. Al-Kaisy, A. and ***Kerestes, E.*** (2006) "Evaluation of the Effectiveness of Single-Lane Two-Way Traffic Control at Maintenance & Reconstruction Zones" *Canadian Journal of Civil Engineering*, Vol. 23, No. 9, pp 1217-1226.
37. Al-Kaisy, A. (2006) "Passenger Car Equivalents for Heavy Vehicles at Freeways & Multilane Highways: Some Critical Issues" The Institute of Transportation Engineers, *ITE journal*, March 2006.
38. Hardy, A., **Lee, S.**, and Al-Kaisy, A. (2006) "Effectiveness of Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool: A Case Study in Rural Montana" *In Transportation Research Record 1973*, the Journal of the Transportation Research Board, pp. 64-72.
39. Rakha, H. A., Katz, B., and Al-Kaisy, A. (2006) "Field Evaluation of Truck Weigh-in-Motion Operations," *Journal of Intelligent Transportation Systems*, Taylor & Francis, Volume 10, No. 2. pp. 49-57.
40. Al-Kaisy, A. and Nassar, K. (2005) "Nighttime Construction Issues Revisited," *Journal of Construction Research*, volume 6, part 1, pages 139-156
41. Al-Kaisy, A., **Jung, Y.**, and Rakha, H. (2005) "Developing Passenger Car Equivalency Factors for Heavy Vehicles during Congestion" *Journal of Transportation Engineering*, American Society of Civil Engineers (ASCE), Vol. 131, issue 7, pp 514-524.
42. Al-Kaisy, A., **Bhatt, J.** and Rakha, H. (2005) "Modeling the Effect of Heavy Vehicles on Sign Occlusion at Multilane Highways," *Journal of Transportation Engineering*, American Society of Civil Engineers (ASCE), Volume 131, issue 3, pp. 219-229.
43. Al-Kaisy, A. and **Jung, Y.** (2004) "Examining the Effect of Heavy Vehicles on Traffic Flow during Congestion," *Road and Transport Research*, Vol. 13, No. 4, pp. 3-14.
44. Al-Kaisy, A., **Bhatt, J.** and Rakha, H. (2004) "Assessing the Effect of Heavy Vehicles on the Visibility of Traffic Signs at Multilane Highways," *Journal of Transportation Engineering*, ASCE Publications, Vol. 130, No. 5, pp. 648-657.
45. Al-Kaisy, A. and Hall, F. L. (2003) "Guidelines for Estimating Capacity at Freeway Reconstruction Zones" *Journal of Transportation Engineering*, American Society of Civil Engineers (ASCE), Vol. 129, No. 5, pp. 572-577.
46. Nassar, K., Al-Kaisy, A., and **Abu Hilal, L.** (2003) "Simulation of Asphalt Paving Operations Under Lane Closure Conditions," *Journal of Automation in Construction*, Elsevier Science, Vol. 12, No. 5, pp. 527-541.
47. Al-Kaisy, A., Hall, F. L., and ***Reisman, E.*** (2002) " Developing Passenger Car Equivalents for Heavy Vehicles During Queue Discharge Flow" *In Transportation Research - Part A*, Elsevier Science, Vol. 36, no. 8, pp 61-78.
48. Al-Kaisy, A., and Stewart, J. A. (2001) "New Approach for Developing Warrants of Protected Left-Turn Phase at Signalized Intersections," *In Transportation Research – Part A*, Elsevier Science, Vol. 35, no. 6, pp 561-574.
49. Al-Kaisy, A., and Hall, F. L. (2001) "Examination of the Effect of Driver Population at Freeway Long-Term Reconstruction Zones" *In Transportation Research Record 1776*, Transportation Research Board, pp. 35-42.
50. Hall, F. L., Wakefield, S., and Al-Kaisy, A. (2001) "Freeway Quality of Service: What Matters the Most to Drivers and Passengers" *In Transportation Research Record 1776*, Transportation Research Board, pp. 17-23.
51. Al-Kaisy, A., Zhou, M., and Hall, F. L. (2000) "New Insights into Freeway Capacity at Work Zones: An Empirical Case Study" *In Transportation Research Record 1710*, Transportation Research Board, pp. 154-160.

52. Al-Kaisy, A. and Hall, F. L., (2000) "The Effect of Darkness on the Capacity of Long-Term Freeway Reconstruction Zones," In *Transportation Research Circular E-C018*. pp. 164-175.
53. Al-Kaisy, A., Stewart, J. A., and Van Aerde, M. (1999) "A Simulation Approach for Examining Capacity and Operational Performance at Freeway Diverge Areas" *Canadian Journal of Civil Engineering*, Vol. 26, pp. 760-770.
54. Al-Kaisy, A., Stewart, J. A., and Van Aerde, M. (1999) "Microscopic Simulation of Lane Changing Behavior at Freeway Weaving Sections," *Canadian Journal of Civil Engineering*, Vol. 26, pp. 840-851.
55. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2019) "Investigation of Passing Segment Optimal Length on 2+1 Highways," Transportation Research Records, TRB, Washington, DC, in review.
56. **Bell, M.**, Wang, Y., and Al-Kaisy, A. (2019) "Risk Mapping Wildlife-Vehicle Collisions across the State of Montana," Transportation Research Records, TRB, Washington, DC, in review.
57. Al-Kaisy, A. and **Huda, K. T.** (2019) "Identifying Sites for Safety Improvements on Low-Volume Rural Roads: A Review," Transport Reviews, Taylor & Francis, in review.

Peer-Reviewed Articles in Conference Proceedings

58. **Relph, D.**, Al-Kaisy, A. and Gleason, R. (2020) "Drivers' Behavior When Passing Bicyclists along Rural Recreational Routes," Presented at the 99th Transportation Research Board Annual Meeting, Washington, DC, 12-16 January 2020.
59. Al-Kaisy, A., Ewan, L., and **Hossain, F.** (2019) "Identifying candidate locations for safety improvements on low-volume rural roads: the Oregon experience," Transportation Research Circular E-C248: 12th International Conference on Low-Volume Roads, Kalispell, Montana, September 15-18.
60. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. "Investigation of Passing Segment Optimal Length on 2+1 Highways," Presented at the 98th Transportation Research Board Annual Meeting, Washington, DC, 12-16 January 2019.
61. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. "Passing Lane Optimum Length on Two-Lane Highways," Presented at the 98th Transportation Research Board Annual Meeting, Washington, DC, 12-16 January 2019.
62. **Bell, M.**, Wang, Y., and Al-Kaisy, A. "Risk Mapping Wildlife-Vehicle Collisions across the State of Montana," Presented at the 98th Transportation Research Board Annual Meeting, Washington, DC, 12-16 January 2019.
63. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2018) "Investigation of Passing Lane Effective Length on Two-Lane Two-Way Highways," Presented at the 97th TRB Annual Meeting, January 7-11, 2018.
64. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2018) "Evaluation of Passing Lane Design Configurations on Two-Lane Highways," Presented at the 97th TRB Annual Meeting, January 7-11, 2018.
65. Al-Kaisy, A., **Jafari, A.**, and Washburn, S. (2018) "Traffic Operations on Rural Two-Lane Highways: a Review on Performance Measures and Indicators," Presented at the 97th TRB Annual Meeting, January 7-11, 2018.

66. Al-Kaisy, A., and **Siddiqui, S.** (2017) "Drivers' Compliance with a Variable Advisory Speed System along an Urban Freeway Corridor," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
67. **Siddiqui, S.,** and Al-Kaisy, A. (2017) "Assessing the Safety Effects of an Advisory Variable Speed Limit System along an Urban Freeway Corridor," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
68. **Siddiqui, S.,** and Al-Kaisy, A. (2017) "Effect of Advisory Variable Speed Limit on The Fundamental Flow Diagrams along Urban Freeway," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
69. Al-Kaisy, A., and Ewan, L. (2017) "Prioritization Scheme for Proposed RWIS Sites: Montana Case Study," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
70. Al-Kaisy, A., **Jafari, A.,** and Washburn, S. (2017) "Following Status and Percent Followers on Two-Lane Two-Way Highways: Empirical Investigation," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
71. Al-Kaisy, A., **Jafari, A.,** and Washburn, S. (2017) "Measuring Performance on Two-Lane Highways: Empirical Investigation," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
72. Al-Kaisy, A., **Jafari, A.**, Washburn, S., Luttinen, T and Dowling, R. (2016) "Performance Measures on Two-Lane Highways: Survey of Practice," Presented at the Transportation Research Board 95th Annual Meeting, January 10-14, 2016.
73. Al-Kaisy, A., Ewan, L., and **Hossain, F.** (2016) "Economic Feasibility of Safety Improvements: Oregon's Low-Volume Roads Case Study," Presented at the Transportation Research Board 95th Annual Meeting, January 10-14, 2016.
74. Ewan, L., Al-Kaisy, A., and **Hossain, F.** (2016) "Safety Effects of Road Geometry and Roadside Features on Low-Volume Roads," Presented at the Transportation Research Board 95th Annual Meeting, January 10-14, 2016.
75. Wang, Y., Veneziano, D., Russel, S. and Al-Kaisy, A. (2016) "Traffic Safety along Tourist Routes in Rural Areas," Presented at the committee meeting for the Transportation Needs of National Parks and Public Lands Committee (ADA40) during the TRB 95th Annual Meeting, January 10-14, 2016.
76. Sangster, J, Rakha, H., and Al-Kaisy, A. (2015) "Comparative Analysis of the Through-about, Roundabout, and Conventional Signalized Intersection Designs" Presented at the TRB 94th Annual Meeting, January 2015.
77. **Ewan, L**., Al-Kaisy, A. and Veneziano, D. (2013) "Weather Sensing and Road Surface Conditions: Is Technology Mature for Reliable ITS Applications?" Presented at the Transportation Research Board 92nd Annual meeting in Washington DC, January 13-17.
78. Al-Kaisy, A., Veneziano, D. Dorrington, C., and **Kirkemo, Z.** (2012) "Usage Estimation at Rest Areas on Rural Interstate and Arterial Highways: Practical Guidelines" Presented at the Transportation Research Board 91st Annual Meeting in Washington, D.C., January 22-26.
79. Al-Kaisy, A. and **Durbin, C.** (2011) "Platooning on Two-Lane Two-Way Highways: An Empirical Investigation" Proceedings of the 6th International Symposium on Highway Capacity and Quality of Service, Stockholm, Sweden, June 28-July 1, Elsevier, Volume 16.
80. Al-Kaisy, A. and **Freedman, Z.** (2011) "Empirical Examination of Passing Lane Operational Benefits on Rural Two-Lane Highways," Proceedings of the 6th International Symposium on Highway Capacity and Quality of Service, Stockholm, Sweden, June 28-July 1, Elsevier, Vol. 16.

81. Al-Kaisy, A., **Roefaro, S.** and Veneziano, D. (2011) "Effectiveness of Signal Control at Channelized Right Turning Lanes: An Empirical Study" Presented at the 90th TRB Annual meeting, Jan. 23-27.
82. Al-Kaisy, A., **Church, B.** Veneziano, D. and Dorrington, C. (2011) "Investigation of Parking Dwell Time at Rest Areas on Rural Highways," Presented at the 90th TRB Annual meeting, Jan. 23-27.
83. Ismeik, M. and Al-Kaisy, A. (2011) "Characterization of Cell Phone Use while Driving: The Jordan Experience," Presented at the 90th TRB Annual meeting, January 23-27.
84. Al-Kaisy, A., **Kirkemo, Z.**, Veneziano, D. and Dorrington, C. (2011) "Traffic Usage of Rest Areas on Rural Highways: A Recent Empirical Study" Presented at the 90th TRB Annual meeting, January 23-27.
85. Al-Kaisy, A. and **Roefaro, S.** (2010) "Channelized Right-Turn Lanes at Signalized Intersections: A Review of Practice," The Fourth International Symposium on Highway Geometric Design, Valencia, Spain, June 1-5.
86. Al-Kaisy, A., ***Kreider, T.*** and ***Pothering, R.*** (2010) "Speed Selection at Sites with Restrictive Geometries: A Case Study," The 20th Canadian Multidisciplinary Road Safety Conference, Niagara Falls, Canada, June 6-9.
87. Al-Kaisy, A. and **Freedman, Z.** (2010) "Estimating Performance on Two-Lane Highways: Case Study Validation of a New Methodology," Presented at the Transportation Research Board 89th Annual Meeting, January 10-14.
88. Al-Kaisy, A., Hardy, A., and ***Nemfakos, C.*** (2009) "Static Warning Signs of Occasional Hazards: Do They Work?" The Canadian Multidisciplinary Road Safety Conference, Saskatoon, Canada, June 7-10.
89. Al-Kaisy, A. and **Karjala, S.** (2008) "Indicators of Performance on Two-Lane Rural Highways: An Empirical Investigation." Presented at the Transportation Research Board 87th Annual Meeting, Washington D.C., January 13-17.
90. Al-Kaisy, A. and **Karjala, S.** (2008) "Car-Following Interaction and the Definition of Free-Moving Vehicles on Two-Lane Rural Highways." Presented at the Transportation Research Board 87th Annual Meeting, Washington D.C., January 13-17.
91. Al-Kaisy, A. and **Durbin, C.** (2007) "Estimating Percent Time Spent Following on Two-Lane Highways: Field Evaluation of New Methodologies" Presented at the Transportation Research Board 86th Annual Meeting, January 21-25.
92. Rakha, H., Hancock, K., and Al-Kaisy, A. (2007) "Estimating Truck Equivalencies for Freeway Sections" Presented at the Transportation Research Board 86th Annual Meeting, January 21-25.
93. Al-Kaisy, A. and **Freedman, Z.** (2006) "Weather Responsive Signal Control: Practical Guidelines," Presented at the Transportation Research Board 85th Annual Meeting, January 22-26.
94. Hardy, A., **Lee, S.**, and Al-Kaisy, A. (2006) "Effectiveness of Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool: A case study in rural Montana" Presented at the Transportation Research Board 85th Annual Meeting, January 22-26.
95. Al-Kaisy, A. and ***Kerestes, E.*** (2005) "Evaluation of the Effectiveness of Single-Lane Two-Way Traffic Control at Maintenance & Reconstruction Zones" Presented at the Transportation Research Board 84th Annual Meeting, Washington, D.C., 9-13 January.
96. Al-Kaisy, A., **Bhatt, J.**, and Rakha, H. (2003) "Modeling the Effect of Heavy Vehicles on Sign Visibility at Multilane Highways," presented at the Transportation Research Board 82nd Annual Meeting in January 2003.

97. Rakha, H. A., Katz, B., and Al-Kaisy, A. (2003) "Field Evaluation of Weigh-in-Motion Screening on Truck Weigh Station Operations," IEEE Intelligent Vehicle Symposium, Columbus, OH, June 9-11.
98. Al-Kaisy, A., **Bhatt, J.** and Rakha, H. (2003) "Assessing the Effect of Heavy Vehicles on the Visibility of Traffic Signs at Multilane Highways," presented at the Transportation Research Board 82nd Annual Meeting in January 2003.
99. Al-Kaisy, A. and Nassar, K. (2003) "Nighttime Construction Issues Revisited," presented at the Transportation Research Board 82nd Annual Meeting in January 2003.
100. Katz, B., Rakha, H., and Al-Kaisy, A. (2003) "A Modeling Framework and Case Study Evaluation of Weigh Station Operations" presented at the Transportation Research Board 82nd Annual Meeting, Jan. 2003.
101. Al-Kaisy, A., and **Bhatt, J.** (2002) "A Simulation Approach to Investigate the Effect of Heavy Vehicles on Sign Visibility" Proceedings of the TRB 16th Biennial Symposium on Visibility and Simulation, June 2002, Iowa City, Iowa
102. Al-Kaisy, A. and Hall, F. L. (2002) "Guidelines for Estimating Freeway Capacity at Long-Term Reconstruction Zones" Presented at the Transportation Research Board 81st Annual Meeting, Washington, D.C., January 2002.
103. Al-Kaisy, A., Hall, F. L., and ***Reisman, E.*** (2001) "Developing Passenger Car Equivalents for Heavy Vehicles on Congested Freeways: A Capacity-Based Approach" Presented at the Transportation Research Board 80th Annual Meeting, Washington, D.C., January 7-11.
104. Al-Kaisy, A., and Hall, F. L. (2001) "Examination of the Effect of Driver Population at Freeway Long-Term Reconstruction Zones" Presented at the Transportation Research Board 80th Annual Meeting held in Washington, D.C., January 7-11.
105. Hall, F. L., **Wakefield, S.**, and Al-Kaisy, A. (2001) "Freeway Quality of Service: What Matters the Most to Drivers and Passengers." Presented at the Transportation Research Board 80th Annual Meeting, Washington, D.C., 7-11 January 2001.
106. Al-Kaisy, A., Zhou, M., and Hall, F. L. (2000) "New Insights into Freeway Capacity at Work Zones: An Empirical Case Study," Presented at the Transportation Research Board 79th Annual Meeting in Washington, D.C., January 9-13.
107. Al-Kaisy, A., and Hall, F. L. (2000) "The Effect of Darkness on the Capacity of Long-Term Freeway Reconstruction Zones," Presented at the Fourth International Symposium on Highway Capacity, Maui, Hawaii, June 27-July 1.
108. Al-Kaisy, A., and Stewart, J. A. (1999) "Warrants for Protected Left-turn Phase at signalized Intersections," Proceedings of the Transportation Research Board 78th Annual Meeting, Washington D.C., January 7-13.

Abstract Peer Reviewed Articles Presented at Professional Meetings

109. Bertini, R., Downey, M., Al-Kaisy, A., Ewan, L., and Veneziano, D. (2015) Effects of Adverse Weather on Freeway Performance and Potential Performance Benefits From Variable Advisory Speed System, Portland State University Research Symposium, Portland, Oregon.
110. Bertini, R., Downey, M., Al-Kaisy, A., Ewan, L., and Veneziano, D. (2014) "Evaluation of Weather Responsive Variable Advisory Speed System in Portland, Oregon," Proceedings of the 21st World Congress on Intelligent Transport Systems, Detroit, Michigan, September 2014.

111. **Freedman, Z.** and Al-Kaisy, A. (2014) "Investigation of Performance and Lane Utilization within a Passing Lane on a Two-Lane Rural Highway" Presented at the TRB Symposium Celebrating 50 Years of Traffic Flow Theory, Portland, Oregon, August 11-13, 2014.

112. **Ewan L.**, Al-Kaisy, A. and Veneziano, D. (2013) Development of Weather-Responsive Variable Speed Limit System, National Rural ITS Conference, St. Cloud, Minnesota, August 25-28, 2013.

113. Al-Kaisy, A., Veneziano, D. and **Ewan, L.** (2012) "Weather Based Variable Speed Limits" Presented at the Northwest Transportation Conference, Kiewit Center for Infrastructure and Transportation, Oregon State University, Corvallis, Oregon, February 7-9, 2012.

114. ***Watson, D.,*** Al-Kaisy, A., and ***Anderson, N.*** (2012) "Examining the Effect of Speed, Roadside Features and Roadway Geometry on Crash Experience along a Rural Corridor," Presented at the Southeastern Transportation Center Student Poster Session held in conjunction with the Transportation Research Board (TRB) 91st Annual Meeting, January 22-26, 2012.

115. Al-Kaisy, A. and Ye, J. (2010) "Explore ITS Technologies for Work Zones and Work Zone Impact Areas" Presented at the National Rural ITS (NRITS) conference 2010, Huntington, West Virginia, August 1-4.

116. Al-Kaisy, A. and Veneziano, D. (2009) "Weather Adaptive Traffic Control: Practice, Technology, and Future Outlook," Presented at the National Rural ITS (NRITS) conference 2009, Seaside, Oregon, August 23-27.

117. Al-Kaisy, A. and ***Freedman, Z.*** (2006) "Weather Responsive Signal Control: Practical Guidelines," Presented at the National Rural ITS (NRITS) conference 2006, Big Sky, Montana, August 13-16.

118. Al-Kaisy, A. and **Jung, Y.** (2005) "Examining the Effect of Heavy Vehicles on Traffic Flow during Congestion," Proceedings of the Institute of Transportation Engineers (ITE) 2005 Annual Meeting in Melbourne, Australia, August 7-10.

119. Al-Kaisy, A., Wolff, R., ***Rust, D.***, and ***Lyson, K.*** (2005) "Development of Wireless Traffic Monitoring System for ITS Instruction and Research" Presented at the Institute of Transportation Engineers (ITE) District 6 Annual Meeting, Kalispell, Montana, July 10-13.

120. **Lee, S.**, Hardy, A. and Al-Kaisy, A. (2005) "Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool in the Bozeman Pass Wildlife Movement Corridor, Montana" Presented at the Institute of Transportation Engineers (ITE) District 6 Annual Meeting, Kalispell, Montana, July 10-13.

121. Al-Kaisy, A., and Nassar, K. (2004) "Developing a Decision-Making Assisting Tool for Nighttime Construction in Highway Projects" Proceedings of the 32nd Annual CSCE Conference, Saskatoon, Saskatchewan, Canada, June 2-5.

122. Al-Kaisy, A., **Jung, Y.**, and Rakha, H. (2004) "Developing Passenger Car Equivalency Factors for Heavy Vehicles during Congestion" Proceedings of the 32nd Annual CSCE Conference, Saskatoon, Saskatchewan, Canada, June 2-5.

123. Al-Kaisy, A. F., Stewart, J. A., and Van Aerde, M. (1999) "Examination of Lane Changing Behavior in INTEGRATION Traffic Simulation Model," Proceedings of the Canadian Institute of Transportation Engineers Annual Conference, Montreal.

124. Hall, F. L., **Wakefield, S.**, and Al-Kaisy, A. (2001) "Freeway Quality of Service: What Matters the Most to Drivers and Passengers." Presented in the mid-year meeting of the TRB Capacity and Quality of Service Committee, Truckee, CA, July 24-28.

125. Al-Kaisy, A., and Hall, F. L. (2000) "Quality of Service on Freeways: Are We Talking the Same Language?," Proceedings of the Annual Conference of the Canadian Society for Civil Engineering (CSCE) 2000, London, Ontario, Canada, June 7-10.

126. Al-Kaisy, A., Stewart, J. A., and Van Aerde, M. (1999) "The Use of Computer Simulation to Estimate Freeway Capacity at Areas of Concentrated Turbulence," Proceedings of the Canadian Institute of Transportation Engineers Annual Conference, Montreal.

127. Al-Kaisy, A. F., Stewart, J. A., and Van Aerde, M. (1998) "The Use of Microscopic Simulation to Explore Traffic Stream Models at Freeway Merges, Diverge & Weave Areas" Proceedings of the Institute of Operation Research and Management Sciences (INFORMS) 1999 Meeting in Philadelphia, November 7-10.

Professional Publications

128. Al-Kaisy, A., Ewan, L. (2016) "Innovative Safety Solutions with Pavement Markings and Delineation" The American Traffic Safety Services Association (ATSSA), available at: https://www.atssa.com/cvweb/cgi-bin/msascartdll.dll/ProductInfo?productcd=ISSPMD

129. Ewan, L., Al-Kaisy, A., and Veneziano, D. (2013) "Help from above: Noninvasive Sensors Assist with Pavement Condition" Roads and Bridges Magazine, March, 2013. Available at: http://www.roadsbridges.com/sites/default/files/44_non-invasive%20road%20sensors_R&B0313.pdf

130. Veneziano, D., Villwock-Witte, N. and Al-Kaisy, A. (2011) "Cost Effective Local Road Safety Planning and Implementation" The American Traffic Safety Services Association (ATSSA), available at: http://www.countyengineers.org/ResourcesEdu/PublishingImages/Local%20%20Roads%20NACE%20ATSSA.pdf

Selected Research Reports

Improved Analysis of Two-Lane Highway Capacity and Operational Performance, Final Report, NCHRP project 17-65. Available at: http://www.trb.org/Main/Blurbs/177835.aspx

Assessment of Montana Road Weather Information System (RWIS), Montana Department of Transportation, Final Report, January 2017. Available at:

http://www.mdt.mt.gov/other/webdata/external/research/DOCS/RESEARCH_PROJ/RWIS_ASSESS/Final_Report.PDF

Montana Weigh-In-Motion and Automatic Traffic Recorder Strategy, Montana Department of Transportation, Final Report, March 2017. Available at:

http://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/wim/FINAL_REPORT.pdf

Site Prioritization Model for Montana RWIS, Montana Department of Transportation, Interim Report, October 2016. Available at:

http://www.mdt.mt.gov/other/webdata/external/research/DOCS/RESEARCH_PROJ/RWIS_ASSESS/Task_7.PDF

Risk Factors Associated with High Potential for Serious Crashes, Oregon Department of Transportation, Final Report, SPR 771, September 2015. Available at:

https://www.oregon.gov/ODOT/TD/TP_RES/ResearchReports/SPR771_RiskFactors_092115.pdf

Evaluation of a Variable Speed Limit System for Wet and Extreme Weather Conditions, Oregon Department of Transportation, Phase One Report, SPR 743, June 2012. Available at: http://ntl.bts.gov/lib/45000/45500/45584/SPR743_VSL_System.pdf

City of Bozeman Parking Study, A Project Completed for the City of Bozeman Parking Commission and Downtown Bozeman Partnership, February 2018. Available at: https://www.bozeman.net/Home/ShowDocument?id=5335

Rest Area Use: Data Acquisition and Usage Estimation, Final Report, Report FHWA/MT-10-009/8202, FHWA and Montana Department of Transportation, February 2011. Available at: http://www.mdt.mt.gov/other/research/external/docs/research_proj/rest_area/final_report.pdf

Bozeman Pass Wildlife Channelization ITS Project, Final Report, Report No. 425539, FHWA and Montana Department of Transportation, June 2006. Available at: http://www.mdt.mt.gov/other/research/external/docs/research_proj/boz_wildlife/channel/final_report.pdf

Static Warning Signs for Occasional Hazards: Survey of Practice, University Transportation Center, US DOT, UTC, Final Report, July 2006. Available at: http://trid.trb.org/view.aspx?id=789985

Nighttime Construction: Evaluation of Construction Operations, Final Report, Report No. ITRC FR 00/01-5, ITRC Project IVA-H2, FY 00/01, Illinois Transportation Research Center, May 2004. Available at: http://ntl.bts.gov/lib/24000/24800/24805/IVA-H2_FY01_02.pdf

Nighttime Construction: Evaluation of Lighting for Highway Construction Operations in Illinois, Final Report, Report No. ITRC FR 00/01-2, ITRC Project VD-H1, FY 00/01, Illinois Transportation Research Center, August 2003. Available at: http://ntl.bts.gov/lib/24000/24700/24796/Final_Report_ITRC_VD-H1.pdf

GRADUATE STUDENTS ADVISED

- Advisor for 26 graduate students (24 Masters and 2 PhD students)

Matthew Campbell (MSU)
David Relph (MSU)
Mahmoud Alzioud (MSU)
Amir jafari (MSU)
Otmane Eljdid (MSU)
Tahsin Huda (MSU)
Brandy Sularz (MSU)
Sohrab Siddiqi (MSU)
Fahmid Hossein (MSU)
Levi Ewan (MSU)

Nours Mohammed (MSU)
Zachary Kirkemo (MSU)
Nabil El-Ferradi (MSU)
Casey Durbin (MSU)
Trevor Iman (MSU)
Kingston Chirwa (MSU)
Jigar Bhatt (Bradley University)
Badr Zerktouni (MSU)
Sommer Roefaro (MSU)
Zachary Freedman (MSU)
Sarah Karjala (MSU)
Scott Lee (MSU)
Cody Salo (MSU)
Salma Chittoor Kader (MSU)
Younghan Jung (Bradley University)
Dorukhan Duruk (MSU)

- Member of advisory committee for 19 Masters and one PhD students

Mayura Sreenivasa (MSU)
Azza Abdallah (AUS)
Trevor Evans (MSU)
Lili Liang (MSU)
Brian Church (MSU)
Travis Eickman (MSU)
Nicholas W. Jack (Bradley University)
Anas Al-Khatib (Bradley university)
Amir Jamali (MSU)
Aldo Videa (MSU)
Shivam Sharda (MSU)
Aaron Berger (MSU)
Tiffany Rochelle (MSU)
Joey Stasczuk (MSU)
Joey Paskey (MSU)
Luai Abu Hilal (Bradley University)
Amir El-Shereef (Bradley Univ.)
Hordur Gunnarsson (Bradley Univ.)
Matthew Bell (MSU)

UNDERGRADUATE RESEARCH ASSISTANTS

Matthew Bell (City of Bozeman project)
Joseph Bauer (City of Bozeman project)
Matthew Campbell (City of Bozeman project)
Jacob Roske (Independent Study)
Matthew Probert (Montana DOT project)
Allen Ziesman (Oregon DOT project)
Janice Simmons (Oregon DOT project)
Guilherme Miyake (International Exchange Program)
Tyler Krieder (NSF REU)
Ryan Pothering (NSF REU)
Nathan Anserson (NSF REU)
Donald Watson (NSF REU)
Charles Nemfacos (MDT Funded Project)
Doug Rust (Senior Design Project – Wireless monitoring system project)
Kyle Lyson (Senior Design Project – Wireless monitoring system project)
Eric Kerestes (NSF REU)
Zachary Freedman (NSF REU)
Emily Reisman (NSERC funded project)
Kody Swartz (Montana DOT project)

COURSES TAUGHT

At Montana State University

- Traffic Flow Theory & fundamentals

- Transportation Safety
- Traffic Engineering & ITS
- Highway Geometric Design
- Transportation Planning
- Transportation Engineering

At the American University of Sharjah

- Highway Geometric Design
- Transportation Engineering and Planning
- Traffic Engineering
- Elementary Surveying
- Introduction to Statistical Analysis

At Bradley University

- Airport Engineering
- Advanced Traffic Engineering
- Introduction to Transportation Engineering
- Civil Engineering Materials
- Geotechnical Engineering

At McMaster University

- Land Use and Transportation
- Highway Materials and Pavement Design

HONORS AND AWARDS

- Recipient of the *College of Engineering Excellence in Research Award 2018*
- Nominee for the *College of Engineering Excellence in Research Award 2017*
- Recipient of the Albert Nelson Marquis Lifetime Achievement Award 2017
- Editorial Board Member, Transportation and Transit Systems, Frontiers in Built Environment
- Editorial Board Member, International journal for Traffic and Transport Engineering (IJTTE)
- Recipient of the Iraqi Talent Award, Iraqi Academic Conference, The National Academies, Washington, DC, March 14-15 2009.
- Member, Iraqi American Academic and Professional Community (IAAPC) – Civil Engineering Committee
- MSU DEAL Program, 2017-2018.
- Leadership MSU Program 2008-2009
- Recipient of Caterpillar Fellowship, Bradley University 2003
- GRASP Award, Bradley University, 2001 and 2002
- Queen's Graduate Fellowship; 1998-1999
- Queen's Graduate Awards; 1998-1999, 1997-1998, 1996-1997

- Samuel McLaughlin Fellowship; 1997-1998
- Carleton University Graduate Award and Fellowship; 1996-1997
- Sabbatical leave, 2011-2012

PROFESSIONAL AND UNIVERSITY SERVICE

Committees and Assignments (Montana State University)

- Member, Planning Task Force, Vice President for Research and Economic Development (VPRGEED) – Graduate Education, summer 2019.
- Chair, University Graduate Council (Fall 2017, Fall 18- present)
- Search Committee Chair, CE transportation faculty position 2019.
- Vice Chair, University Graduate Council (Spring 2017, Spring 18)
- Member, University Graduate Council (Fall 2014 – Spring 2016)
- Assistant to the Provost Search Committee 2014
- Department head search committee member 2018.
- Transportation faculty Search Committee member (2005 & 2013)
- MSU Strategic Planning Committee, 2008-2011
- MSU Space Management Committee, 2008-2011
- University Appeals Committee – summer 2006
- Civil Engineering Curriculum Committee, 2003-present
- Spring Engineering Festival Organizing Committee, 2003-2008
- Graduate Coordinator – Transportation Program, 2003-present
- Civil Engineering Scholarship Committee 2006-present
- Institute of Transportation Engineers (ITE) faculty advisor, 2004-present
- Director, Transportation Lab 2004-present
- Committee member – Western Transportation Institute (WTI) Graduate Fellowships, 2003-2010
- Committee member for WTI-UTC student of the year award, 2003-2010
- Interview Committee – MDT Design Unit internship program, 2003-2008
- Undergraduate student advising
- Graduate student advising
- Member – Study Abroad Interview Committee - Office of the International Programs (2004-2005)
- Student Conduct Board member – academic year 03-04, 04-05
- CE–101 Lecture on Transportation Engineering (Fall 05, Spring 06, Fall 06)

Committees and Assignments (Bradley University)

- Ph.D. program task force committee member (2002-2003)
- Midwest Traffic Conference committee member - Center for Emerging Technologies in Infrastructures CETI, Civil Engineering Department, Bradley University, (2002-2003)
- Director of Civil Engineering and Construction Library (2002-2003)
- Director of Geotechnical Lab (2001-2003)

- Civil Engineering Program Committee member (2001-2003)
- Co-advisor for the Associated General Contractors (AGC) student organization (2001-2002)
- Research Excellence Committee member (2001-2002)
- Teaching Excellence Committee member (2001-2002)
- Graduate Program Committee member (2001-2002)
- Tenure and promotion task force (2001)

Professional Affiliations

- Professional Engineer: State of Montana, License # 18377
- Member, Institute of Transportation Engineers, 2003-present
- Member, American Society for Engineering Education (ASEE), 2008-2010, 2016-present
- Member, TRB Joint Sub-Committee ABG10(1) "Ahead of the Curve: Mastering the Management of Transportation Research"
- TRB University Representative 2004-present
- Canadian Association of Road Safety Professionals, 2004 and 2009-2011
- Member, ROI subcommittee, TRB Visualization in Transportation Committee (ABJ95), 2009
- Transportation Research Board (TRB) individual affiliate 1998-2006
- American Society of Civil Engineers 2001-2003
- Canadian Society of Civil Engineering 1999-2000, 2004-2005
- Member, Council on Undergraduate Research (CUR) 2009-present
- Iraqi Society for Higher Education Abroad 2005-present
- International Society of Iraqi Scientists 2001-2016
- Order of the Engineers 2007-present

Other Professional Service

- Technical panel member, NCHRP project 15-75 (2019-present)
- Panelist, TRB webinar "Improved Analysis of Two-Lane Highway Capacity and Operational Performance," March 25, 2019. http://www.trb.org/Main/Blurbs/178779.aspx
- Technical panel member, NCHRP project 03-132 (2017 – present)
- Invited speaker, Kittelson & Associates, Portland, Oregon, July 17, 2019.
- Invited speaker and panelist, TRB session 786 "Beyond 3D: Progressive Visualization for Geometric Design" TRB 2009 Annual Meeting, Washington, D.C., January 15, 2009. Workshop sponsored by Visualization in Transportation Committee (ABJ95), Geometric Design Committee (AFB10), Project Delivery Methods (AFH15), Operational Effects of Geometrics Committee (AHB65), and Simulation and Measurement of Vehicle and Operator Performance committee (AND30).
- Proposal expert reviewer, SUNY 4E Network of Excellence, 2013
- Reviewer of documents for the year 2010 Highway Capacity Manual (HCM)
- Proposal expert reviewer, City University of Hong Kong, 2009
- Proposal expert reviewer, Pacific Northwest Transportation Consortium, 2014
- Invited Speaker, World Usability Day, Walking as a Transportation Mode, Western Transportation Institute, Bozeman, Montana, November 13, 2008

- Invited Speaker, Summer Transportation Institute, WTI, Bozeman, Montana, 2007, 2008, 2009 & 2010.
- Invited Speaker, CE-101 Introduction to Civil Engineering 2006, 2007 and 2008.
- Reviewer of the Institute of Transportation Engineers (ITE) Manual of Transportation Engineering Studies, 2nd Edition, 2010
- Reviewer of the Institute of Transportation Engineers (ITE) Traffic Engineering Handbook, 6th Edition, 2009
- Chair: Intelligent Transportation Systems session, Canadian Society of Civil Engineering Annual Meeting, Saskatoon June 2-4, 2004.
- Program Committee Member and coordinator, the Midwest Traffic Conference, Bradley University, Peoria, Illinois, 4-5 March 2003.
- Reviewer of the PEO (Professional Engineers-Ontario) traffic engineering examination (fall 2000)
- Journal Reviewer
    - *Transportation Research Records*, Journal of the Transportation Research Board
    - *Transportation Research – Parts B & F*, Elsevier Science
    - *ASCE Journal of Transportation Engineering*
    - *Canadian Journal of Civil Engineering*
    - *Computer-Aided Civil and Infrastructure Engineering*
    - *Journal of Advanced Transportation*
    - *Journal of Transportation Safety and Security*
    - *Transportation Research Forum*
    - *Advances in Transportation Studies*
    - *Case Studies on Transport Policy, Elsevier Science*
    - *Frontiers in Built Environment – Transportation and Transit Systems*